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**Shabtay et al.**

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(54) **DUAL APERTURE ZOOM DIGITAL CAMERA**

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(58) **Field of Classification Search**  
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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

9,405,099 B2 \* 8/2016 Jo ..... G02B 13/0045  
9,576,369 B2 \* 2/2017 Venkataraman .. H01L 27/14618  
(Continued)

FOREIGN PATENT DOCUMENTS

JP 2013106289 A \* 5/2013 ..... H04N 5/2258  
JP 5741395 7/2015

OTHER PUBLICATIONS

JP 2013106289 A; May 2013; Machine English Translation; Japan Platform Patent Information; pp. 1-18.\*  
(Continued)

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(57) **ABSTRACT**

A dual-aperture zoom digital camera operable in both still and video modes. The camera includes Wide and Tele imaging sections with respective lens/sensor combinations and image signal processors and a camera controller operatively coupled to the Wide and Tele imaging sections. The Wide and Tele imaging sections provide respective image data. The controller is configured to combine in still mode at least some of the Wide and Tele image data to provide a fused output image from a particular point of view, and to provide without fusion continuous zoom video mode output images, each output image having a given output resolution, wherein the video mode output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, and wherein at the lower ZF the output resolution is determined by the Wide sensor while at the higher ZF value the output resolution is determined by the Tele sensor.

**7 Claims, 8 Drawing Sheets**

